IN THE SPECIFICATION

Please make the following changes to the specification:

For the Paragraph on Page 4, beginning at Line 17:

Fig. ~~I~~1 is a top view showing an optical scanning apparatus according to a preferred embodiment of the present invention;

For the Paragraph on Page 5, beginning at Line 4:

Fig. 4a is a diagram illustrating a relationship between a light polarizing direction and a reflectance of a reflective surface of a scanning surface upon which the light from a light source is impinged for various values of angle ~~θ~~θ including a range of 62.5° to 72.5° according to a preferred embodiment of the present invention;

For the Paragraph on Page 5, beginning at Line 8:

Fig. 4b is a diagram illustrating a relationship between a light polarizing direction and shading which is produced on the scanning surface for values of angle ~~8~~θ shown in Fig. 4a;

For the Paragraph on Page 5, beginning at Line 10:

Fig. 5a is a diagram illustrating a relationship between a light polarizing direction and a reflectance of a reflective surface of a scanning surface upon which the light from a light source is impinged for various values of angle ~~θ~~θ including a range of 17.5° to 27.5° according to another preferred embodiment of the present invention;

For the Paragraph on Page 5, beginning at Line 14:

Fig. 5b is a diagram illustrating a relationship between a light polarizing direction and shading which is produced on the scanning surface for values of angle ~~θ~~θ shown in Fig. 5a;

For the Paragraph on Page 5, beginning at Line 16:

Fig. 6a is a diagram showing a light usage amount when an aperture having a rectangular shape and an angle of tilt ~~θ~~θ=90° according to a comparative example which was prepared for comparison to preferred embodiments of the present invention;

For the Paragraph on Page 5, beginning at Line 19:

Fig. 6b is a diagram showing light usage amount when an aperture having a rectangular shape and an angle of tilt ~~θ~~θ =0° according to a comparative example which was prepared for comparison to preferred embodiments of the present invention;

For the Paragraph on Page 5, beginning at Line 22:

Fig. 6c ~~is a diagram~~ and 6d are diagrams showing light usage amount when an aperture having a rectangular shape and an angle of tilt ~~θ~~θ=45° according to a comparative example which was prepared for comparison to preferred embodiments of the present invention;

For the Paragraph on Page 5, beginning at Line 25:

Fig. 7a is a diagram showing light usage amount when an aperture having a rectangular shape and an angle of tilt ~~θ~~θ=22.5° according to a preferred embodiment of the present invention;

For the Paragraph on Page 6, beginning at Line 1:

Fig. 7b is a diagram showing light usage amount when an aperture having a rectangular shape and an angle of tilt ~~θ~~θ=67.5° according to a preferred embodiment of the present invention;

For the Paragraph on Page 6, beginning at Line 4:

Fig. 8a is a diagram showing light usage amount when an aperture having a square shape and an angle of tilt ~~θ~~θ=90° according to a comparative example which was prepared for comparison to preferred embodiments of the present invention;

For the Paragraph on Page 6, beginning at Line 7:

Fig. 8b is a diagram showing light usage amount when an aperture having a square shape and an angle of tilt ~~θ~~θ=0° according to a comparative example which was prepared for comparison to preferred embodiments of the present invention;

For the Paragraph on Page 6, beginning at Line 10:

Fig. 9 is a diagram showing light usage amount when an aperture having a square shape including cut corner portions and an angle of tilt ~~θ~~θ=45° according to a preferred embodiment of the present invention;

For the Paragraph on Page 6, beginning at Line 13:

Fig. 10a is a diagram showing light usage amount when an aperture having a rectangular shape including cut corner portions and an angle of tilt ~~θ~~θ=22.5° according to a preferred embodiment of the present invention;

For the Paragraph on Page 6, beginning at Line 16:

Fig. 10b is a diagram showing light usage amount when an aperture having a rectangular shape including cut corner portions and an angle of tilt ~~θ~~θ=67.5° according to a preferred embodiment of the present invention;

For the Paragraph on Page 7, beginning at Line 6:

Fig. ~~1~~1 is a diagram showing an optical scanning device in accordance with a preferred embodiment of the present invention. In Fig. 1, a preferred optical scanning apparatus includes a light source ~~1~~1 for generating a laser beam which is to be used in a scanning process as will be described in detail below. A collimator lens 2 is arranged close to the light source ~~1~~1 for shaping a laser beam emitted from the light source 1 into a parallel beam. It should be noted that in one preferred embodiment of the present invention, the light source ~~1~~1 and the collimator 2 are integrally formed in a unitary body. Such an integral unit including the light source 1 and the collimator 2 allows for easier handling, initial assembly and replacement.

For the Paragraph on Page 7, beginning at Line 21:

In Fig. ~~1~~1, the angle ~~a~~α defined by the optical axis of the components of the optical system located before the deflector and the optical axis of the components of the optical system located after the deflector is preferably about 60°. X1(Y) and X2(Y) indicate the profiles in the plane of deflection of the first and second surfaces, respectively, of the scanning lens 6 in the direction of the laser beam propagation (that is, the configuration as shown in Fig. 1). Both of the first and second surfaces of the scanning lens 6 as indicated by the profiles X1(Y) and X2(Y) have an aspheric profile, which can be expressed, for example, as follows: assuming that the coordinate in the direction of the optical axis is X, the coordinate in the direction perpendicular

to the optical axis is Y, the paraxial radius of curvature is R, and the higher-order coefficients are A, B, C, D, ..., the following equation holds true:

~~[FORMULA HERE]~~

$$X = \frac{Y^2}{\left\{\frac{R + \sqrt{1 - (1 - K)\, Y^2}}{R^2}\right\}} + A * Y^4 + B * Y^6 + C * Y^8 + D * Y^{10} + \cdots$$

For the Paragraph on Page 8, beginning at Line 6:

Further, in the preferred embodiment shown in Fig. 1, the optical scanning lens 6 constitutes the scanning image formation lens itself, and establishes a conjugate relationship in a geometric-optic manner between the position where the line image is formed and the scanning surface 7 with respect to a sub-scanning direction (the Z-axis direction in Fig. ~~I~~1). Further, it is shaped so as to satisfactorily compensate for the curvature of field in the sub-scanning direction. Thus, the first and second lens surfaces are "toric surfaces" as shown in Figs. 2(a) and 2(b).

For the Paragraph on Page 8, beginning at Line 13:

The profiles of the surfaces of the optical scanning lens 6 with respect to the sub-scanning direction are indicated by $X\cancel{1}_1(Y)$ and $X\cancel{2}_2(Y)$, as shown in Fig. 1.

For the Paragraph on Page 8, beginning at Line 15:

In the plane of deflection, the paraxial radius of curvature of the first and second lens surfaces are indicated by R1 and R2, and the refractive index of the lens material is indicated by N. Specifically, in this preferred embodiment, the scanning lens has the following characteristics~~.~~:

$R_1 = 160.3,\ K_1 = -58.38,$

$A_1 = -9.22923E - 07,\ B\cancel{1}_1 = 3.65515E - 10,$

$C_1 = -8.34355E - 14,\ D\cancel{1}_1 = 1.113E - 17,$

$R_2 = -139.3,\ K\cancel{2}_2 = 4.83,$

$A_2 = -9.71348E - 07,\ B\cancel{2}_2 = 2.37E - 10,$

$C_2 = -8.06014E - 14,\ D\cancel{2}_2 = 2.65E - 17.$

For the Paragraph on Page 8, beginning at Line 25:

The sub-scanning radius of curvature can be expressed by the following equation~~.~~:

~~[FORMULA HERE]~~

$$rs(y) = r_s(0) + a \bullet Y_2 + b \bullet Y_4 + c \bullet Y_6 + d \bullet Y_8 + e \bullet Y_{10} + f \bullet Y_{12} + \bullet \bullet \bullet$$

For the Paragraph on Page 8, beginning at Line 27:

And, the sub-scanning radius of curvature preferably has the following characteristics~~.~~:

rs1(~~Θ~~0) = -108.6, a_1 = 7.8~~Θ~~03E - 02,

b_1 = -3.15051E - 04, c_1 = 8.16834E - 07,

d_1 = -~~I~~1.10138E -09, e_1 = 7.352E - 13,

f_1 = -1.8802E – 16

rs2(~~Θ~~0) = -15.09, a_2 = -2.00512E - 03,

b2 = 3.17274E -06, c_2 = -4.04628E - 09,

d2 = 5.72209E - 12, e_2 = -4.22019E - 15,

f2 = 1.24827E - 18.

For the Paragraph on Page 9, beginning at Line 9:

Characteristics indicated in Table ~~I~~1 below are also satisfied by the scanning lens used in the preferred embodiment.

i	R~~I~~1	dl	N
0		33.2	
1	160.3	13.5	1.51933
2	-139.3	128.3	

Table 1

For the Paragraph on Page 9, beginning at Line 17:

In the first conventional arrangement shown in Fig. 3(a), the active layer ~~1~~1c of the laser coincides with the light deflecting direction of the light deflector 5 (the Y-axis direction). In the second conventional arrangement shown in Fig. 3(b), the active layer 1~~-~~c of the laser coincides with a direction perpendicular to the light deflecting direction of the light deflector 5 (the Y-axis direction).

For the Paragraph on Page 9, beginning at Line 22:

In the third conventional arrangement shown in Fig. 3(c), the active layer 1c of the laser is inclined at a specific angle with respect to both the light deflecting direction (the Y-axis direction) and the direction perpendicular to the light deflecting direction (the Z-axis direction). More specifically, the laser is rotated by an angle ~~θ~~θ=45° around the optical axis. Numeral ~~1~~1d indicates the oscillation region in the active layer 1c.

For the Paragraph on Page 10, beginning at Line 13:

Figs. 4a, 4b, 5a and 5b show reflectance and shading, respectively, with the light source being arranged as shown in Figs. 3(a) through 3(c) at angles of ~~θ~~θ=90° (Fig. 3a), ~~θ~~θ=0° (Fig. 3b) and ~~θ~~θ=45°. Also, shown in Figs. 4a, 4b, 5a and 5b are reflectance and shading when the light source is arranged at angles of ~~θ~~θ=17.5°, ~~θ~~θ=22.5°, ~~θ~~θ=27.5°, ~~θ~~θ=45°, ~~θ~~θ=62.5°, ~~θ~~θ=67° and ~~θ~~θ=72.5° according to preferred embodiments of the present invention.

For the Paragraph on Page 10, beginning at Line 24:

When the light source 1 is rotated by an angle ~~θ~~θ=45° around the optical axis, as shown in Fig. 3(c), the direction of polarization of the beam impinging upon the reflective surface 5a of the light deflector 5 is located directly between the P-polarized light and the S-polarized light. Although as is seen in viewing Fig. 3(c), the arrangement of the light source emits a laser beam which is impinged on the reflective surface so as to include P-polarized light and S-polarized light (Fig. 3(c)) and so that the laser beam impinges on the reflective surface at a substantially perpendicular orientation relative to the reflective surface, this only addresses the shading and reflectance problem. That is, the angle of ~~θ~~θ=45° was determined in the conventional device shown in Fig. 3(c) to be idea for providing good values for shading and reflectance.

For the Paragraph on Page 11, beginning at Line 4:

However, it was not previously known that the ~~θ~~θ=45° creates significant problems with light usage. That is, although ~~θ~~θ=45° produces good reflectance and shading results, this angle causes problems with light usage, as will be explained in more detail later.

For the Paragraph on Page 11, beginning at Line 7:

Thus, the prior art, shown in Figs. 3(a), 3(b) and 3(c) only recognized that angles of ~~θ~~θ=0°, ~~θ~~θ=45° and ~~θ~~θ=90° could be used, and did not recognize any problems with using a value of 45° for ~~θ~~θ.

For the Paragraph on Page 11, beginning at Line 10:

However, as is seen in Figs. 4a, 4b, 5a and 5b and also with respect to Figs. 7a and 7b described later, changing the angle ~~θ~~θ to values of from about 17.5 to 27.5 and from about 62.5 to about 72.5, each of the problems of shading, reflectance and light usage are addressed in an extremely effective and successful manner. More specifically, by using angles of ~~θ~~θ equal to from about 17.5 to 27.5 and from about 62.5 to about 72.5, reflectance and shading are very good as seen in Figs. 4a, 4b, 5a and 5b, and also the light usage is excellent as seen in Figs. 7a and 7b.

For the Paragraph on Page 11, beginning at Line 17:

To see the differences in light usage, comparative examples shown in Figs. 6a, 6b, ~~and~~ 6c, and 6d were prepared for comparison to the results achieved with preferred embodiments of the present invention shown in Figs. 7a and 7b.

For the Paragraph on Page 11, beginning at Line 20:

As seen in Fig. 6a, a rectangular aperture is used and ~~θ~~θ=90°. Light usage is very good as seen by the fact that the periphery of the aperture is located completely within the beam spot. However, as seen in Figs. 4a, 4b, 5a and 5b, reflectance and shading are very poor when ~~θ~~θ=90°.

For the Paragraph on Page 11, beginning at Line 24:

As seen in Fig. 6b, a rectangular aperture is used and ~~θ~~θ=0°. Light usage is very good as seen by the fact that the periphery of the aperture is located completely within the beam spot. However, as seen in Figs. 4a, 4b, 5a and 5b, reflectance and shading are very poor when ~~θ~~θ=0°.

For the Paragraph on Page 11, beginning at Line 28:

As seen in Fig. 6c and 6d, a rectangular aperture is used and ~~θ~~θ=45°. Although as seen in Figs. 4a, 4b, 5a and 5b, reflectance and shading are good when ~~θ~~θ=45°, light usage is very poor as seen by at least two large corner or peripheral areas of the aperture are located outside of the beam spot.

For the Paragraph on Page 12, beginning at Line 3:

In order to maximize the quality of shading, reflectance and tight usage, the angle ~~θ~~θ is changed to values of from about 17.5° to 27.5° and from about 62.5° to about 72.5° as described above. As seen in Figs. 7a and 7b, the light usage is very good when ~~θ~~θ=22.5° and when ~~θ~~θ=72.5°, and as seen in Figs. 4a, 4b, 5a and 5b, the shading and reflectance are also very good when ~~8~~θ=22.5° and when ~~8~~θ=72.5°.

For the Paragraph on Page 12, beginning at Line 8:

It should be noted that while the values of angle ~~8~~θ=22.5° and ~~θ~~θ=72.5° are the most preferred for achieving an excellent combination of high quality shading, reflectance and light usage, other values of angle ~~8~~θ from about 17.5 to 27.5 and from about 62.5 to about 72.5 can be used and still achieve very high quality of each characteristic of shading, reflectance and light usage.

For the Paragraph on Page 12, beginning at Line 13:

In the preferred embodiments shown in Figs. 7a and 7b, the shape of the aperture is preferably rectangular. A square shaped aperture may be used in another preferred embodiment of the present invention shown in Fig. 9. As seen in Fig. 9, when using a square shaped aperture, the angle ~~θ~~θ preferably has a value of 45° so that the shading and reflectance are very good as seen in Figs. 4a, 4b, 5a and 5b and so that the light usage is also very good as seen in Fig. 9.

For the Paragraph on Page 12, beginning at Line 19:

Compare the excellent results achieved in the preferred embodiment shown in Fig. 9 with those of the comparative examples shown in Figs. 8a and 8b. Although light usage is good in Figs. 8a and 8b, where ~~θ~~θ has a value of 90 and 0 degrees, respectively, the shading and reflectance are very poor when ~~θ~~θ has a value of 90 and 0 as described above.

For the Paragraph on Page 12, beginning at Line 23:

In another preferred embodiment shown in Figs. 10a and 10b, a substantially rectangular aperture is used and ~~θ~~θ has a value of about 22.5° and about 67.5°, respectively. However, in order to provide excellent quality of shading, reflectance and light usage, while also eliminating a side lobe problem shown in Fig. 11~~-1~~a, the aperture preferably has cut corner portions. More specifically, at least two and preferably four of the corner portions of the substantially rectangular aperture are cut so as to define oblique angles relative to the longer and shorter sides of the substantially rectangular aperture. As seen in Figs. 10a and 10b, the cut corner portions improve light usage even further and as seen in Fig. 11-b, eliminates the side lobe problem which occurs in Fig. 11a.

For the Paragraph on Page 13, beginning at Line 3:

While in the above-described preferred embodiments a single laser beam is used, the light source ~~I~~1 may be a monolithic semiconductor 20 in which a plurality of laser diodes 21, 22, and 23 are arranged in a row in a single chip, for example, as shown in Fig. 13. By using such a light source, it is possible to write data on the scanning surface 7 through a plurality of scanning lines at one time, thereby achieving an increase in writing speed and resolution of written data.

For the Paragraph on Page 13, beginning at Line 9:

As is the case in the above-described preferred embodiments, when the light source comprises a semiconductor having a plurality of light emission points, the direction of polarization of the emitted laser beam is inclined relative to the optical axis with respect to the deflecting direction of the light deflector and the direction perpendicular to the deflecting direction so that the direction of the laser beam impinging upon the reflective surface 5a of the light deflector 5 may be between the P-polarized light and the S-polarized light and include a combination thereof preferably at an angle ~~θ~~θ having a value of about 17.5° to 27.5° or about 62.5° to about 72.5°. As a result, it is possible to make shading substantially constant within the scanning range of the scanning surface. Thus, it is possible to obtain a satisfactory image having no variation in light intensity, while also maximizing light usage.

For the Paragraph on Page 13, beginning at Line 19:

Generally, assuming that the deflecting direction of the reflective surface 5a of the light deflector 5 is the main scanning direction (the Y-axis direction) and that the direction perpendicular thereto is the sub-scanning direction (the Z-axis direction), the optical system from the light source 1 to the light deflector (the collimator lens 2, the aperture 3 and the cylindrical lens 4 in the case of Fig. 1) is preferably arranged, as schematically shown in Fig. 12, so as to be symmetrical with respect to each of the directions. In order that the direction of the laser beam emitted from the light source ~~I~~1 may be substantially between the P-polarized light and the S-polarized light as described with reference to the above-described preferred embodiments, the arrangement and inclination angle of the light source 1 is determined and set before use of the optical scanning apparatus such that the polarization direction of the laser beam is preferably about 17.5° to about 27.5° or about 62.5° to about 72.5° with respect to the main scanning direction and the sub-scanning direction.

For the Paragraph on Page 14, beginning at Line 1:

When the light source 1 is an edge-emitting type laser diode, the direction of polarization of the emitted laser beam is generally parallel to the active layer, so that the light source ~~I~~1 is preferably inclined such that the active layer is substantially at an angle 17.5° to about 27.5° or about 62.5° to about 72.5° with respect to both the main scanning and sub-scanning directions.

For the Paragraph on Page 14, beginning at Line 6:

When the light source is inclined as described above, the shape ~~I~~1' of the output laser beam is also inclined as shown in Fig. 14. This may be the case when the edge emitting type laser diode, in particular, is used. In the case of the surface emitting type laser diode, since the oscillation region may be formed in any shape, it may be formed substantially as a circle, for example, so as not to affect the shape of the output laser beam even when the light source is inclined. However, generally, in the case of the edge-emitting type laser diode, the oscillation region is elongated in the direction of the active layer, so that the emitted laser beam has an elliptical shape elongated in a direction perpendicular to the direction of the active layer. Thus, when the active layer of the edge-emitting type laser diode is inclined, the laser beam has an inclined shape, and the light intensity distribution thereof is asymmetric relative to the directions respectively corresponding to the main scanning and sub-scanning directions.

For the Paragraph on Page 14, beginning at Line 18:

To shape the asymmetric intensity distribution of the laser beam, the inner diameter of the aperture 3 is preferably made smaller than the size of the collimated laser beam 1' so that the beam spot on the scanning surface 7 becomes satisfactory, as shown in Fig. 14. The size and spot diameter of a laser beam preferably has a light intensity which is substantially equal to ~~I~~<u>1</u>/e~~2~~$^{\underline{2}}$ (which equals 0.135) of the maximum light intensity. Accordingly, the asymmetric intensity distribution of the laser beam may be sufficiently shaped when the inner diameter of the aperture 3 is included in an area which is set to be ~~I~~<u>1</u>/e~~2~~$^{\underline{2}}$ of the central intensity of the collimated laser beam 1', as is the case of the aperture 3 shown in Fig. 16.

For the Paragraph on Page 14, beginning at Line 26:

As described above, in accordance with the present invention, there is provided an optical scanning device in which a laser beam from a light source is deflected by a light deflector having a reflective surface and is focused to a spot on a scanning surface by a scanning lens, wherein the light source is inclined at an angle having a value of about 17.5° to about 27.5° or about 62.5° to about 72.5°~~θ~~ with respect to both the deflecting direction and a direction perpendicular to the deflecting direction in a plane perpendicular to the optical axis, whereby the laser beam from the light source impinges upon the reflective surface as a polarized light including P-polarized light and S-polarized light, thereby making it possible to provide maximum light usage while minimizing shading and to reduce variations in the light intensity of the image.

For the Paragraph on Page 15, beginning at Line 12:

When an aperture is provided between the light source and the light deflector, and the inner diameter of the aperture is smaller than the diameter of an area determined to be ~~h~~<u>1</u>/e2 of the central intensity of the laser beam, the beam can be easily controlled, and a desired beam diameter can be obtained on the scanning surface.